PATENT SPECIFICATION

629,318

Application Date: March 11, 1947. No. 6735/47.

Complete Specification Accepted: Sept. 16, 1949.

Index at acceptance:—Classes 8(i), C2a4b; and 80(iii), A4a1a.

COMPLETE SPECIFICATION

Improvements in Mechanism for Converting or Conveying Motion

We, WILLIAM ERNEST BRUGES, British Subject, JOSHUA BRUMER, of Palestinian nationality, and NICHOLAS VLADIMIR PESTEREFF, British Subject, trading in copartnership as THE HEAT ENGINE COMPANY OF SCOTLAND, of 4, Albyn Place, Edinburgh, Scotland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to mechanism for the interconversion of reciprocatory and rotary motion in engines, compressors, and the like having cylinders parallel to a transmission shaft, and of the kind in which the mechanism comprises a reciprocatory crosshead articulated to a star-plate which is mounted on a slant on the shaft by means of a wrist pin movable with respect to the crosshead.

The object of the present invention is to provide means for permitting and controlling transverse movement of the wrist pin with respect to the crosshead in a direction at right angles to the axis of reciprocation and in the plane of rotary motion of the slant, the said transverse movement of the wrist pin being controlled in such a manner as to prevent excessive transverse movement which might give rise to metallic impact and damage to the mechanism during transient conditions, such as when the shaft overruns the reciprocatory mechanism or *vice-versa*.

According to the present invention, mechanism for the interconversion of reciprocatory and rotary motion comprises a reciprocatory crosshead, a rotary shaft parallel to the axis of reciprocation of said crosshead, an inclined disc or slant fixed on said shaft, a star plate rotatably mounted on said slant, an arm extending radially from said star plate, a cylindrical wrist pin secured to said arm with the axis of the cylindrical surface of said pin at right angles to the radial axis of said arm and always lying in the plane of the slant, a member having a cylindrical chamber therein arranged to completely house said pin which is movable therein, said chamber extending transversely through said member, and means closing both ends of said chamber to provide cushioning and clearance spaces for both ends of said pin, said member being movable in an aperture in the crosshead, and the said aperture being radially disposed with respect to the axis of the shaft. The said member movable in the crosshead is preferably cylindrical and enclosed in a cylindrical sleeve or cap which moves in a cylindrical bush in the crosshead. Provision is made for lubricating the parts by providing a lubricating passage in the star plate arm, said passage opening through the wrist pin into the ends of said cylindrical chamber in which the wrist pin is movable, and outlet ports in the sleeve or cap are controlled by the ends of said wrist pin so that, in the event of excessive movement of said wrist pin transversely with respect to its radial movement in the crosshead, the wrist pin will throttle or close the said outlet ports, thus trapping the lubricant therein and effecting cushioned or dashpot control of the wrist pin.

The invention will be more readily understood by reference to the accompanying drawings in which Fig. 1 is a sectional view of the preferred form of our invention. Fig. 2 is a sectional plan view of the wrist pin and dashpot, and Fig. 3 is a sectional view on the line A—A of Fig. 2 with the wrist pin in side view.

Fig. 1 illustrates star plate mechanism for one of the reciprocatory units of an engine having the cylinders parallel to a transmission shaft 12, the reciprocatory units being of the coaxial cylinder type having pistons 6 connected to a crosshead 5. A slant 11 is secured to the shaft 12 and is embraced by a star plate 8 having bearing rings 9 and 10 within which the

[Price 2/-]

slant 11 is rotatable. The star plate 8 is circular and has a plurality of radial arms, one for each reciprocatory unit, one arm 13 being shown in Fig. 1. The arm 13 is articulated to the crosshead 5 by means of a wrist pin 3, which is rigidly secured by a hollow stud 7 to the arm 13, and a pin head 2 with cap 1 is also secured thereby. The pin 3 is cylindrical and fits in a transverse cylindrical chamber 15 formed in the pin head 2, which is cylindrical about an axis radial to the axis of the shaft 12. The wrist pin 3 is shorter than the transverse chamber 15 formed in the pin head 2 and is free to slide therein. The cap 1 is cylindrical and is pressed over the pin head 2; dashpot spaces 16 are thus formed between the inner surface of the cap 1 and the ends of the wrist pin 3, which preferably has its ends shaped as shown in Fig. 2 to the same radius as the radius of curvature of the inner surface of the cylindrical cap 1, which is slidable in a bush 4 provided in the crosshead 5, the aperture in the crosshead being disposed at right angles to the axes of the pistons 6 and shaft 12, so that the pin head 2 and cap 1 are free to move radially with respect to the shaft 12, and the cap 1 and pin head 2 are free to oscillate within the bush 4 about the radial axis of the radial arm 13 when the arm 13 and wrist pin 3 oscillate with the slant 11.

Oil or other lubricant under pressure is supplied to the hollow shaft 12 and flows through a radial duct 17 in the slant 11, star plate 8, and hollow stud 7, into a chamber 22 formed in the pin head 2, flowing from thence around the wrist pin 3 to spaces 16. Channels 18 in the pin head 2 and ports 19 in the side of the cap 1 feed the lubricant through ports 20 in the bush 4 to piston cooling ducts 14. The lubricant which enters the dashpot spaces 16 through grooves 23 in the pin head 2 escapes through outlet ports 21 in the pin head 2. The grooves 23 have been omitted from Fig. 1 and are indicated in Fig. 3.

When the slant 11 rotates, in normal operation, driving or driven by shaft 12, any point on the arm 13 describes a figure eight on the surface of a sphere and the wrist pin 3 oscillates about the central position shown in Fig. 2, the degree of oscillation being controlled by the geometry of the mechanism, the friction forces cancelling one another.

As the star-plate 8 wobbles about its mid-position, the ports 21 are uncovered by the wrist pin 3, allowing the lubricant to escape to a sump.

During transient conditions, such as when the shaft 12 overruns the crosshead 5, the friction forces no longer neutralize each other, and the star-plate would tend to be carried over to the limit of its freedom. This would result in metallic knocking and damage to the parts, were it not for the cushioning effect of the dashpot spaces 16. When the frictional forces tend to drive the star-plate round, the excessive movement of the wrist pin 3 throttles or closes the outlet ports 21, thus trapping lubricant in the spaces 16 and effectively restraining excessive oscillation of the wrist pin 3 and interposing a cushioning fluid between the ends of the wrist pin 3 and the inner surface of the cap 1.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Mechanism of the kind described for the interconversion of reciprocatory and rotary motion comprising a reciprocatory crosshead, a rotary shaft parallel to the axis of reciprocation of said crosshead, a slant fixed on said shaft, a star plate rotatably mounted on said slant, an arm extending radially from said star plate, a cylindrical wrist pin secured to said arm with the axis of the cylindrical surface of said pin at right angles to the radial axis of said arm and in the plane of the slant, a member having a cylindrical chamber therein arranged to completely house said pin which is movable therein, said chamber extending transversely through said member, and means closing both ends of said chamber to provide cushioning and clearance spaces for both ends of the said pin, said member being movable in an aperture in the crosshead and said aperture being radially disposed with respect to the axis of the shaft.

2. Mechanism according to claim 1 in which the member movable in the crosshead is cylidrical and the means closing the ends of the chamber in said member consists of a cylindrical sleeve or cap which moves in a cylindrical bush in the crosshead.

3. Mechanism according to claim 2 having a lubricating passage in the star plate arm, said passage opening through the wrist pin into the ends of the cylindrical chamber in which the said pin is movable, and outlet ports in the ends of said chamber, said outlet ports being controlled by the ends of said pin for the purpose hereinbefore set forth.

4. Mechanism having the features claimed in claims 2 and 3 in which the ends of the wrist pin are curved to a radius of curvature conforming to that of the inner cylindrical surface of the

sleeve or cap.

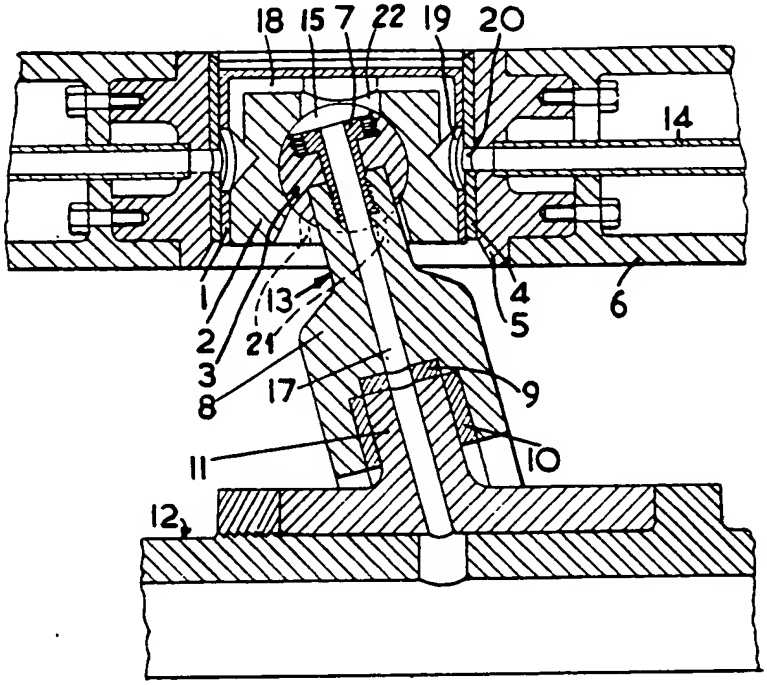
5. Star plate mechanism constructed, arranged and operating substantially as herein described with reference to the accompanying drawings.

6. Engines, compressors and the like having cylinders parallel to a transmission shaft and having star plate mechanism substantially as herein described with reference to the accompanying drawings.

Dated this 10th day of March, 1947.
JOHNSON & BURGESS,
Chartered Patent Agents,
44, Queen Street, Edinburgh, 2.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1949.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. 0d. each (inland) 2s. 1d. (abroad) may be obtained.

FIG. 1.



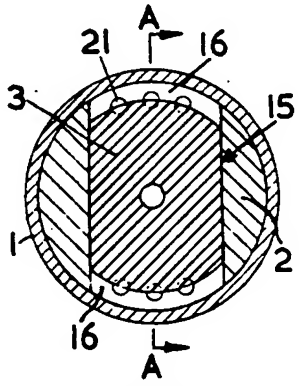


FIG. 2.

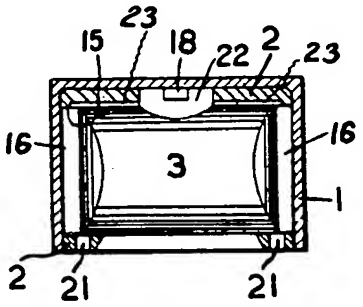


FIG. 3.

H.M.S.O.(Ty. P.)